a comet, it was deemed best to warn northern observers. Hence the following telegram was sent to Harvard College Observatory:

May 5, 1916.

Bright object visible here last night nine to ten. Moved from *alpha Pavonis* ten degrees toward Sun's place. Tail. Possibly a comet.

It is not considered, however, that its nature can be established without observations from other points. Requests for observations were sent to the newspapers but no reports have been received.

Dr. Glancy has investigated the question of an orbit for the positions, which is also interesting from a theoretical standpoint on account of the possibility of such a close approach, and her results follow.

Observatorio Nacional Argentino,
Córdoba, June 16, 1916.

A LUMINOUS OBJECT SUSPECTED TO BE A COMET.

By A. Estelle Glancy.

On the evening of May 4th an object resembling a comet with a long straight tail was seen at Córdoba in the southeast near *α Pavonis,* (see the preceding note by Dr. Perrine). The tail pointed away from the Sun; the motion was directed toward the Sun. Three observations within an interval of an hour showed a motion of 10° on a great circle. Theoretically such an arc might be made to yield some sort of an orbit, and it is interesting to study what can be derived mathematically.

Following are the three observations, by Dr. Perrine and the writer, the middle one unfortunately close to the third, and the first one a casual naked-eye note of the position.

Gr. M. T.	R. A.	Decl.
May 4.548	$20^h\ 18^m.5$	—57°.0
May 4.577	21 02 .3	—55 .8
May 4.585	21 21 .2	—55 .5

(Uncorrected for parallax.)

The calculations presented certain difficulties, but finally the following set of elements was adopted:

$$T = 1916 \text{ June } 14$$
$$i = 103°$$
$$\Omega = 224°$$
$$\omega = 95°$$
$$\log e = 9.967$$
$$\log a = 0.809$$

This orbit satisfies the middle observation (corrected for parallax), and leaves outstanding the following residuals for the first and third places, (corrected for parallax).

(O—C)

	(1)	(3)
$\cos\delta\,\Delta\alpha$	$-0.°04$	$+0°.13$
$\Delta\delta$	$-0\ .49$	$-0\ .29$

A short ephemeris is added.

Gr. M. T.	R. A.	Decl.	$\log\rho$
May 4.577 (middle obs.)	315°	— 57°	7.35
.627	1	— 40	6.99
.677	55	30	7.10
.727	74	47	7.42
.777	82	49	7.62

Too much confidence should not be placed in such an orbit as this, but, whatever its reliability, it has a threefold interest. If the object was a real comet where should it have been searched for on the following morning? Granting a real comet to have been observed at the three given times only, what kind of an orbit could be calculated, if any? And how do the methods of computing orbits hold when a comet and the Earth make a close approach?

The observed motion was such that we were led to predict a possible visibility of the object in the eastern sky on the following morning, and a search was accordingly made. Nothing was seen. If the ephemeris is reliable, our failure to find the object is satisfactorily explained. It could only have been seen in more northern latitudes and in the evening sky.

Altho such an unfavorable case, an orbit satisfying the three given observations has been set up, and it is quite ordinary in its characteristics. In fact, in a rough way, it resembles Comet 1903*c*.

That the calculations would present difficulties was to be expected. It was only by the combined use of the equations given by Oppolzer and those in Leuschner's Short Method

that any kind of an orbit was derived. Without stating the difficulties, it is sufficient to note the unequal intervals, the small value of the geocentric distance, (at the time of the middle observation the geocentric distance was 0.0022 of an astronomical unit), the correspondingly large parallax, and the relative attraction of the Earth, and the short heliocentric arc described by a comet at unit distance from the Sun during an interval of an hour. The attraction of the Earth has been neglected, owing to the anticipated difficulties in its consideration and the hope that the two body problem would be adequate to disprove or confirm the predicted place for the following morning.

Even if only a hypothetical case, here is an example of what may happen at the time of a close approach of comet and Earth: A comet might traverse an arc of 180° in the course of a night, and if it should be an unexpected comet, it would be completely lost if such a short arc orbit has no value.

Considered as a comet, all the evidence is favorable. It was moving toward the Sun. The shape of the tail was fairly permanent. The position angle of the tail projected on to the orbit plane places the tail at an angle of 57° with the radius vector, the tail preceding the radius vector, a deviation which has precedents in previous comets. The elements are entirely reasonable, and the ephemeris explains the failure to find the object on the following morning.

On the other hand, deducting the motion of the Earth, we should have for the motion of a body within the Earth's atmosphere

2° east 1°.5 north

The interpretation of the phenomenon as a quiescent meteor cloud is plausible. Several years ago, in Argentina, there was seen a meteor cloud of this general type, long and narrow and of several hours' duration. The greatest objection to this hypothesis is the permanence of shape. Under the influence of shifting air currents, the cloud should become zigzag, but this difficulty is removed on the assumption of a high altitude where the air currents are known to be more steady. One more objection might be named: the absence

of reports from the numerous meteorological stations scattered about the country.

Only additional observations could establish the character of the object and it must probably remain an open question. But the case has considerable interest in view of its uniqueness, and the numerical results are presented for what they are worth.

Observatorio Nacional,
Córdoba, Argentina,
June 16, 1916.

PLANETARY PHENOMENA FOR SEPTEMBER AND OCTOBER, 1916.

By Malcolm McNeill.

PHASES OF THE MOON, PACIFIC TIME.

First Quarter.	Sept. 4th,	$8^h\ 26^m$	P.M.		First Quarter.	Oct. 4th,	3^h	0^m	A.M.
Full Moon...	" 11th,	12 31	P.M.		Full Moon...	" 10th,	11	1	P.M.
Last Quarter.	" 18th,	9 35	P.M.		Last Quarter.	" 18th,	5	9	P.M.
New Moon...	" 26th,	11 34	P.M.		New Moon...	". 26th,	12	37	P.M.

The Moon will again pass over the *Pleiades* group and a number of the more prominent stars will be occulted in the early morning of October 14th before sunrise. As the Moon is then in the third quarter the immersions will take place on the bright limb. There will be an unusual number of occultations of planets during September and October, but none of these will be observable in the United States. The Moon will pass over *Saturn* and *Neptune* on the night of September 21-22d, and over *Venus* on the morning of September 24th. *Saturn* and *Neptune* will again be occulted on October 19th.

The autumnal equinox, when the Sun crosses the equator from north to south, occurs September 23rd, $1^h\ 14^m$ A. M. Pacific time.

Mercury is an evening star on September 1, setting a little less than an hour after sunset. It is then a little too near the Sun for naked eye visibility. It reaches greatest east elongation on September 9th. The elongation, 26° 54′, is a large one as it comes only about a week after aphelion, but the